

ABSTRACT

A trench MOSFET (Metal Oxide Semiconductor Field Effect Transistor) structure includes crisscrossing trenches formed in a semiconductor substrate. The trenches include inner surfaces filled with conductive material which is electrically separated from the substrate by insulating material. The conductive material is in contact with an overlying first metal layer through a plurality of first contact openings formed in a first insulating layer which is sandwiched between the first metal layer and the trenches. The conductive material in the trenches and the first metal layer constitute the gate of the MOSFET structure. There is also a second metal layer in contact with a source layer formed in the substrate through a plurality of second contact openings formed in a second insulating layer which is sandwiched between the first metal layer and the second metal layer. The second metal layer and the source layer constitute the source of the MOSFET structure. As arranged, the gate and source of the MOSFET structure are connected through separate metal layers on the semiconductor substrate. Consequently, each metal layer maintains higher conductivity and thus faster frequency response. The semiconductor structure formed in accordance with the invention can also assume a higher packing density with lower power-on resistance.